

APPENDIX B. EXAMPLE HEALTH AND SAFETY PLAN

The information contained herein is for guidance only, and does not supersede or otherwise change any applicable state, local, or agency health and safety requirements or programs. A specific health and safety plan should be developed for each site. The example Health and Safety Plan contained herein is not intended to include every type of hazard that could be encountered; rather, it is intended to serve as a starting point for a site-specific analysis for a given project.

B-1 INTRODUCTION

[INSERT CLIENT] has retained [INSERT CONTRACTOR] to evaluate water quality monitoring equipment for measuring the constituents of highway stormwater runoff.

This Health and Safety Plan (HSP) identifies the general health and safety procedures for work to be conducted while monitoring stormwater for the [INSERT CLIENT] project. Implementation of this plan is the responsibility of the [INSERT CONTRACTOR] Project Manager. The [INSERT CONTRACTOR] Site Safety Officer (SSO) assists the [INSERT CONTRACTOR] Project Manager in carrying out this responsibility at the work site by enforcing the requirements of the Health and Safety Plan and by the authority to suspend work to protect worker health and safety. The [INSERT CONTRACTOR] Health and Safety Officer (HSO) may suspend or limit work, or direct changes in work practices, if the [INSERT CONTRACTOR] HSP and/or work practices used are deemed inadequate.

This HSP may not be used for work other than that described in Section B-4. It may not be modified or used beyond the effective date shown in the title page without the written approval of the [INSERT APPROPRIATE AUTHORITY] and the HSO. Portions of the HSP that deal with specific issues related to the sampling sites, such as addresses and route maps to hospitals, will be updated prior to beginning work at the sampling location. These additions to the plan will be submitted to the authorizing officers for approval.

This plan is to be followed by all [INSERT CONTRACTOR] personnel who will be participating in the sampling program. All personnel included in the sampling program shall be responsible for reading this plan and following its procedures.

B-2 PROJECT AND SAFETY PERSONNEL

The following outlines key project and safety personnel involved in the [INSERT CLIENT] Stormwater Monitoring project. This outline presents the names, titles, and specific responsibilities of these individuals in terms of project health and safety.

| Title | Name and Phone Number | Responsibility |
|---------------------------|-------------------------------------|---|
| Health and Safety Officer | [INSERT H&S OFFICER] [PHONE NO.] | 1) Interface with [INSERT CONTRACTOR] personnel and the project managers in matters of health and safety. 2) Develop or review, approve or disapprove project Health |

| | | |
|--------------------------------------|---|--|
| | | <p>and Safety Plans.</p> <ol style="list-style-type: none"> 3) Conduct staff training and orientation on health and safety related activities. 4) Appoint or approve site safety officers. 5) Monitor compliance with Health and Safety Plans and conduct site audits. 6) Assist project managers in obtaining required health and safety equipment. |
| [[INSERT CONTRACTOR] Project Manager | [[INSERT PROJECT MANAGER] [PHONE NO.] | <ol style="list-style-type: none"> 1) Assure that the project is performed in a manner consistent with the [[INSERT CONTRACTOR] Health and Safety Program. 1) Assure that the project is performed in a manner consistent with the [[INSERT CONTRACTOR] Health and Safety Program. 2) Assure that the project Health and Safety Plan is prepared, approved, and properly implemented. 3) Provide the HSO with the information needed to develop the Health and Safety Plan. 4) Implement Health and Safety Plan. 5) Assure that adequate project resources are allocated to fully implement the project Health and Safety Plan. 6) Assure compliance with the Health and Safety Plan by contractor personnel. 7) Coordinate with the HSO on Health and Safety matters. |
| Site Safety Officer | [[INSERT SITE SAFETY OFFICER] [PHONE NO.] | <ol style="list-style-type: none"> 1) Direct health and safety activities on-site. 2) Report immediately all safety-related incidents or accidents to the HSO and project manager. 3) Assist project manager in all aspects of implementing Health and Safety Plans. 4) Maintain health and safety equipment on-site. 5) Implement emergency procedures as required. 6) Conduct health and safety briefings as needed. |

B-3 SITE INFORMATION

[[INSERT SITE-SPECIFIC INFORMATION]]

B-4 WORK ACTIVITIES COVERED BY HEALTH AND SAFETY PLAN

One of the objectives of this project is to [[INSERT PROJECT OBJECTIVE]]. The majority of the field work will consist of crews collecting water samples for water quality analysis from the monitoring station during storms. In addition, some field work will be directed toward station set up and periodic station maintenance, which would occur during dry conditions. Access to some of the monitoring equipment may occur through storm sewer manholes. Other field work that crews could conduct includes setting up and implementing sampling programs (grab sampling and automatic samplers).

Field activities at the monitoring sites will include water quality sample collection (during storm events), in situ monitoring for select water quality parameters (during storm events), and general maintenance activities (ongoing). The hazards associated with all work performed at sampling stations include: (1) being involved in a vehicle accident while driving to or from a site; (2) being struck by a vehicle while working at a site; (3) falling into a stream or open manhole; (4) entering a confined space; (5) experiencing heat and cold stress; and (6) being exposed to hazardous materials or vapors.

[INSERT CONTRACTOR] will maintain water samplers and associated intake system and mounting hardware at all sites. All installation and maintenance procedures at sewer sampling stations will require entry into confined spaces. Confined spaces are large enough and so configured that an employee can enter and perform assigned work, but they have limited openings for entry and exit, and are not intended for continuous employee occupancy. Confined spaces may contain safety or health hazards; these must be identified and controlled or eliminated prior to entry. All [INSERT CONTRACTOR] employees who enter the confined space during installation and maintenance activities will have had confined-space entry training. Additionally, when confined space access is required, at least two trained individuals must be present (one to enter the space; one to observe).

Water sample collection during storm events will be performed by [INSERT CONTRACTOR]. Sample collection will involve one or more visits per site during storm events. It is anticipated that two field crews consisting of two people per crew will be adequate for all sites. The general tasks performed by a crew visiting any given site will consist of: (1) driving to the site; (2) establishing traffic control (if needed); (3) programming and interrogating flow monitor and/or sampler; (4) calibrating and installing continuous in situ water monitor in manhole; (5) removing and replacing sample bottles; (6) taking grab samples; and (7) diverting traffic. These activities do not require entry into storm sewers.

B-5 HAZARD ASSESSMENT

B-5.1 CHEMICAL HAZARDS

Although most of these sites are not known to contain hazardous materials, there is a potential for hazardous gaseous and/or liquid contaminants to be present as the result of industrial runoff and/or illicit storm sewer connections. The presence of chemicals and/or chemical vapors may result in (but is not limited to) one or more of the following threats: toxic conditions, oxygen displacement and explosion and/or fire. The risks associated with these threats include poisoning (acute and/or chronic), asphyxiation, and bodily injury.

B-5.2 CONFINED SPACES

As defined by the U.S. Occupational Safety and Health Administration (OSHA), storm sewers are classified as confined spaces. Regulations for entry into confined spaces are provided in the OSHA Confined Space Standard (Title 29 Code of Federal Regulations (CFR) 1910.146) and [INSERT RELEVANT LOCAL REGULATIONS]. The risks associated with confined spaces include dangerous atmospheres, engulfment, falls, falling objects, and bodily harm due to explosion. Confined Space Entry Procedures to be used during this project are presented in Section B-7.

B-5.2.1 Atmospheric Hazards

Atmospheric hazards that may be present within the storm sewers include oxygen deficiency and toxic or flammable gases. More sewer workers die each year from atmospheric causes than from all other causes combined. Each potential hazard and the recommended evaluation method is presented below:

Oxygen deficiency: Oxygen (O₂) deficiency can be caused by the aerobic decomposition of sewage and organic matter. Chemical and biological processes during the decomposition use the available oxygen. Oxygen deficient atmospheres can also result from displacement by gas such as methane or hydrogen sulfide, which may or may not be harmful, but cannot support life. Oxygen deficiency may be present in areas with little ventilation or air circulation or where biological or chemical processes are occurring. A confined space where water or sewage is enclosed for long periods, and where extensive oxidation of iron (rust) occurs has a high potential for being oxygen deficient.

The normal level of oxygen in the atmosphere is 20.8%. An atmosphere legally oxygen deficient contains less than 19.5% oxygen by volume. An atmosphere containing less than 16% oxygen is considered immediately dangerous to life and health (IDLH). Symptoms of oxygen deficiency include shortness of breath, dizziness, impaired vision, and loss of consciousness.

An atmosphere containing more than 23.5% oxygen by volume is an oxygen enriched atmosphere. This may increase the potential for fire or explosion.

Hydrogen Sulfide: Hydrogen sulfide (H₂S) is a dense, colorless gas that is the byproduct of sewage and organic material that has aerobically decayed. It has the characteristic odor of rotten eggs. Hydrogen sulfide is often present as a dissolved gas in sewage or can be trapped within sewer sediment and sludge. Disturbing the sediment or sludge can release the trapped or dissolved gas.

Initially, the gas anesthetizes the sense of smell, and cannot be detected by odor. Hydrogen sulfide prevents the bonding of oxygen to the hemoglobin molecule contained in the blood cells. Paralysis of the respiratory system is followed by unconsciousness and possibly death.

OSHA has established a ceiling concentration of 20 ppm for H₂S, with a 50 ppm, 10-minute maximum peak concentration. The IDLH concentration is 100 ppm.

Symptoms of hydrogen sulfide poisoning include inflammation of the eyes and lungs, dizziness, loss of coordination, weakness, breathing difficulty, and loss of consciousness.

Carbon Monoxide: Carbon monoxide (CO) is a colorless, odorless gas that acts as a chemical asphyxiant. It is a product of almost any kind of combustion or hydrocarbon oxidation.

The OSHA exposure limit as an 8-hour TWA is 50 ppm. The IDLH concentration is 1,200 ppm.

Symptoms of exposure include headache, dizziness, nausea, weakness, and confusion. In addition the skin becomes cherry red in color.

Methane: Methane (CH₄) is a colorless, odorless gas that is lighter than air. It is produced by the chemical decomposition of sewage and organic matter. Methane is both an asphyxiant and explosive. The lower explosive limit is reached when the concentration of methane reaches 5% of the total atmospheric composition.

B-5.3 PHYSICAL HAZARDS

B-5.3.1 Open Manholes and Manhole Lids

Manhole covers must be opened during water sample collection activities. Opening manholes requires the removal of heavy steel lids, which can easily cause injury if not opened using proper techniques. Failure to remove these lids in a safe manner can put the worker at risk of back injuries and/or crushed toes or feet. Specially designed manhole hooks used with proper lifting techniques provide the easiest and safest method to remove manhole covers.

Open manholes pose a threat to workers and the general public. Limited visibility, inattention, poor site control, slips, and/or trips could result in person falling into an open manhole. The risks of such a fall include bodily injury and/or death.

B-5.3.2 Open Water Hazards

High stream flows commonly associated with storm events present a threat to workers. Slippery conditions, stream-side vegetation, and unstable stream banks could cause a worker to fall into a stream. The risks of such a fall include hypothermia, bodily injury, and drowning.

B-5.3.3 Vehicle Traffic

Traffic hazards will be encountered when working at the side of or in a roadway. These hazards will be increased during times of reduced visibility such as during storm events and at night. The primary threats associated with working in or alongside roadways are workers being struck by passing vehicles or being involved in a vehicular collision. The risk associated with these threats is severe bodily injury and/or death.

B-5.4 BIOLOGICAL HAZARDS

Rodents, pathogenic microorganisms, and viruses are potential biological hazards of concern. The primary threats associated with these hazards are receiving bites and/or contracting disease. The threats associated with these hazards include flesh wounds and/or infections (acute and/or chronic).

B-6 GENERAL HEALTH AND SAFETY REQUIREMENTS

B-6.1 EMPLOYEE CLEARANCE

When [INSERT CONTRACTOR] personnel are directly involved in confined space entry activities, a minimum of two [INSERT CONTRACTOR] employees with an active safety and health clearance status will be present. Active health and safety clearance will consist of training and medical documentation. Entry supervisors, entrants, and attendants will be trained to adequately address all health and safety aspects associated with entry and be medically qualified for confined space entry work. All other field personnel involved in field and/or stormwater sampling activities must receive an on-site briefing from the Site Safety Officer before conducting field work.

B-6.2 SITE SAFETY MEETINGS

All personnel assigned to perform the work described in this HSP must be: (1) given a personal copy of this HSP by a Site Safety Officer; (2) briefed on the health and safety requirements of this HSP by a Site Safety Officer; and (3) must acknowledge receipt of and willingness to comply with the provisions of the plan by signing the attached compliance agreement. Individuals refusing to sign the agreement will not be permitted to conduct field work for this project. Completed agreements shall be provided to the [INSERT CONTRACTOR] Project Manager, who will file them with the [INSERT CONTRACTOR] HSO. Additional briefings should be scheduled and conducted by the Site Safety Officer as needed.

B-6.3 INCIDENT REPORTING

B-6.3.1 PURPOSE

All health and safety incidents shall be reported to [INSERT CONTRACTOR] management and health and safety staff. The prompt investigation and reporting of incidents will reduce the risk of future incidents, better protect [INSERT CONTRACTOR] employees, and reduce [INSERT CONTRACTOR] liability.

B-6.3.2 DEFINITIONS

A health and safety incident is any event listed below:

- Illness resulting from chemical exposure or suspected chemical exposure
- Physical injury, including both those that do and do not require medical attention to [INSERT CONTRACTOR] employees or [INSERT CONTRACTOR] subcontractors
- Fire, explosions, and flashes resulting from activities performed by [INSERT CONTRACTOR] and its subcontractors
- Property damage resulting from activities performed by [INSERT CONTRACTOR] and its subcontractors
- Vehicular accidents occurring on-site, while traveling to and from client locations, or with any non-personal vehicle
- Infractions of safety rules and requirements
- Unexpected chemical exposures
- Complaints from the public regarding [INSERT CONTRACTOR] field operations

B-6.3.3REPORTING PROCEDURES

B-6.3.3.1Reporting Format

Incident reports shall be prepared by completing Form HS-100. This form may be obtained from the [INSERT CONTRACTOR] HSO and is attached at the end of this Plan.

B-6.3.3.2Responsible Party

Reports of incidents occurring in the field shall be prepared by the SSO or, in the absence of the SSO, the supervising field engineer, witness, or injured/exposed individual.

B-6.3.3.3Filing

A report must be submitted to the HSO within 24 hours of each incident involving medical treatment. In turn, the HSO must distribute copies of the report to appropriate company personnel. When an injury or illness is reported, the HSO must deliver a copy of the report to the individual in charge of Human Resources so that a Worker's Compensation Insurance Report can be filed if necessary. Reports must be received within 48 hours of each qualifying incident.

B-6.3.3.4Major Incidents

Incidents that include fatalities, hospitalization of employees or subcontractors, or involve injury/illness of the public shall be reported to the HSO and [INSERT CONTRACTOR] Project Manager as soon as possible. Any contact with the media should be referred to the [INSERT CONTRACTOR] Project Manager and appropriate Authority.

B-6.4PROHIBITED ON-SITE ACTIVITIES

The following are prohibited on-site activities: (1) entering confined spaces without specific training and medical clearance; (2) conducting stormwater sampling without clearance from the Site Safety Officer; (3) eating and drinking without prior decontaminating (e.g., washing hands and face); and (4) smoking. Violations of these prohibitions will result in dismissal from the field crew.

B-7 SITE SPECIFIC HEALTH AND SAFETY REQUIREMENTS

B-7.1 SPECIAL MEDICAL TESTS

Personnel who enter confined spaces must have appropriate medical clearance, including clearance for use of respiratory protection.

B-7.2 SPECIAL TRAINING

Installation of water quality sampling and flow monitoring equipment in storm sewer systems, rating activities, and some station maintenance activities will require confined space entry. Confined space entry requires specific training. [INSERT CONTRACTOR] employees will be completing all confined space work.

B-7.3 PHYSICAL HAZARDS

B-7.3.1 Outfall Sites

Field personnel should not enter drainage channel conduits during a storm event. Rainy conditions can make pipes slippery, and thus increase the possibility of falling. A fall into a drainage pipe that is conveying flow may result in drowning. To minimize this possibility, each sampling crew will be equipped with an extendible sampling pole or similar device to be used for collecting samples from a location outside of the pipe. This same procedure applies to manhole sites.

B-7.3.2 Manhole Lids and Open Manholes

Monitoring sites may require opening manhole lids to gain access to the sampling equipment. Manhole lids are very heavy and bodily injury (e.g., broken foot or wrenched back) can easily occur if lids are not removed or replaced correctly. Each field crew will be given a manhole hook for removing manhole covers. The hook is placed through a hole in the manhole cover and acts as a lever to remove the lid. The lid is removed and replaced by lifting with the legs while keeping the back straight and then sliding the lid to the desired position. However, removal of the manhole lid creates a new hazard. A fall into an open manhole may result in serious injury or death. The area around an open manhole must be cordoned off from the general public by using barricades and/or traffic cones. All field crew members must be informed before a manhole is opened.

B-7.3.3 Work Site and Traffic Control

Work site control and work zones will be established each time a crew visits a sampling station. Field crews will use traffic control cones, warning signs, and vehicles to develop work zones and site control at sites where the safety of crews and the public may be threatened. An example of this would be the use of traffic cones to direct pedestrians away from an open manhole where vehicle traffic control is not required. Site-specific directions for proper vehicle and traffic control device placement in relation to a given sampling station will be added to this document as conditions warrant for the various sites. Modifications or additions to this traffic control section will be made by the Site Safety Officer who will then inform the [INSERT CONTRACTOR] Health and Safety Coordinator.

Traffic hazards pose the greatest risk to workers visiting sampling stations. Traffic hazards to both workers and motorists must be minimized at each sampling station. Standard traffic control measures that can be used to reduce traffic hazards are described below. However, sampling sites may be located in areas where standard traffic measures may not be applicable. In these cases, standard control measures will be modified to meet a given situation.

Warning signs (e.g., Utility Work Ahead, Lane Closed, etc.) will be erected on the roadway or shoulder and shall be removed upon termination of work. Portable signs will be erected vertically, with the bottom of the sign a minimum of 18 inches above the roadway. Portable signs will be illuminated at night and/or be accompanied by a flashing yellow light. Traffic cones or pylons will be placed on the roadway to divert traffic away from the manhole opening. These cones must have reflective striping in order to be visible at night. The cone taper distance from the manhole will be determined by the following equation when speed limit is 40 MPH or less:

$$L = (WS^2)/60$$

where

L = pylon taper length in feet

W = width of desired closure or offset (feet)

S = posted speed limit (miles per hour)

(FHWA, 1988. Manual on Uniform Traffic Control Devices. FHWA-SA-94-027.)

Table B-1 shows taper lengths for various traffic speeds with 5 and 10-foot wide lane closure. A lane closure pertains only to traffic lanes and does not include shoulders or other areas outside the main traffic flow. Site plans have been developed with these criteria.

| TABLE B-1. Traffic Cone Taper Lengths. | | |
|--|----------------------|--------------------------|
| Width of Closure (feet) | Traffic Speeds (mph) | Cone Taper Length (feet) |
| 5 | 25 | 52 |
| 5 | 30 | 75 |
| 5 | 35 | 102 |
| 5 | 40 | 133 |
| 10 | 25 | 104 |
| 10 | 30 | 150 |
| 10 | 35 | 204 |
| 10 | 40 | 267 |

B-7.4HAZARDOUS MATERIALS IDENTIFICATION AND PROTECTION

Stormwater and stormwater sewer systems have the potential to contain hazardous materials and/or microorganisms and should be approached with caution. Industrial and commercial areas are of particular concern because of possible illegal dumping of wastes into the storm sewer system. Any unusual smells and/or discolored sample water are definitely causes for alarm. The following procedures are recommended to help protect field personnel from these hazards:

- ALL MANHOLES MUST BE CHECKED WITH A FOUR GAS METER (oxygen, LEL, carbon monoxide, and hydrogen sulfide) BEFORE THE MANHOLE IS OPENED. This is to determine whether gases are present that may affect persons at the surface when the manhole is opened. This test is conducted through a hole in the manhole lid.
- If dangerous gases are present (determined by gas meters and/or smell), crews will use the following responses:
 - If hazardous levels of non-explosive gases are indicated by the gas meter, crews will stop work and evacuate the area. (Note: Operate under the rule that if it smells bad, it is bad!). The SSO will be notified immediately.
 - If explosive gases are detected in concentrations of 10% of the Lower Explosive Limit (LEL), no one, under any circumstances, will attempt to open the manhole. For methane, this represents a concentration of 0.5%. The SSO must be notified immediately.
- If field crews detect or suspect any dangerous situations, they must notify the SSO of their intended protective procedures.
- Field personnel should wear appropriate gloves when handling stormwater samples. It is important to realize that stormwater can contain dangerous constituents regardless of land use

type. For example, stormwater typically has very high concentrations of bacteria in all areas including streams. All crew members who come into contact with stormwater must decontaminate. This is especially important prior to eating and drinking or smoking. All personnel must also decontaminate before leaving the site. Proper decontamination techniques will ensure that contamination will not spread to vehicles or other locations. Decontamination should include disposal of gloves and washing the hands and face with soap and water. Each crew shall carry 5-gallon containers of wash/drinking water. All crew members must be careful not to contaminate the container.

Procedures for entries will be determined by the anticipated level of hazard. The hazard levels are described in the following text.

Low Hazard Entries

Definition: Includes any stormwater system where there is clearly no potential for connection to a sewer system, and the stormwater system is dry. Under these conditions, no potential for exposure to unknown organics is anticipated. Entries must be completed when there is no precipitation forecasted.

Procedure: Use 4-gas meter to monitor all levels of the space. Verify that the instrument has been calibrated to alarm at the action level, and document all readings. Entry may proceed if explosive levels are below 10% of the LEL; oxygen content is between 19.5% and 22%; hydrogen sulfide is less than 5 ppm; carbon monoxide concentrations are below 15 ppm; and no other hazards are anticipated. Instrument readings will be taken periodically to ensure that conditions remain within specified limits. If any action level is exceeded, forced air ventilation will be provided until concentrations are reduced to acceptable levels. Ventilation of the space will be continuous during occupancy. No CSE permit is required. Fall protection is required for all entries with a vertical drop of greater than 6 feet. A ladder may be used in place of fall protection only if it is in full compliance with the OSHA standard.

Moderate Hazard Entries

Definition: Includes any stormwater system where there is clearly no potential for connection to a sewer system, but the system contains liquids, and therefore may contain unknown organics. Entries must be completed when no precipitation is forecasted.

Procedure: The standard confined space entry form will be used. The supervisor will check off requirements and sign for approval and termination of entry. Monitoring will be conducted with a flame ionization detector or photoionization detector with an 11.7 lamp. Emergency communications and use of an attendant will be required. Organic vapor and 4-gas meter monitoring results must be documented on the form prior to entry. Action levels for LEL, oxygen, hydrogen sulfide, and carbon monoxide will be the same as the low hazard entry. Acceptable levels for organic vapor will be less than 1 ppm above background. If any action level is exceeded, forced air ventilation will be provided until concentrations are reduced to acceptable levels. Ventilation of the space will be continuous during occupancy. Instrument readings will be taken periodically to ensure that conditions remain within specified limits. Fall protection requirements will be the same as the low hazard entry. The space must be ventilated prior to and during entry.

High Hazard Entries

Definition: This includes sewers, entries when there is a potential for precipitation, and any entries where additional hazards are anticipated.

Procedure: The confined space entry standards must be fully implemented. The HSO will coordinate with the project manager to prepare the entry permit.

It is very important to notify all members of the field crew when hazardous situations are encountered. In general, the notification process will consist of notifying the Site Safety Officer. This individual, will in turn, notify higher levels of [INSERT CONTRACTOR] management. However, if the SSO is not available the [INSERT CONTRACTOR] Project Manager must be contacted.

B-7.5 CONFINED SPACE ENTRY PROCEDURES

Storm sewers qualify as confined spaces as defined by OSHA, and are therefore subject to federal regulation. Procedures for confined space entry are given below. All personnel engaged in confined space entry will be required to follow the confined space entry procedures. [NOTE: Contractor (or preparer of HSP) must ensure that procedures provided in the HSP are in compliance with current OSHA regulations.]

B-7.5.1 PURPOSE

Entry into confined spaces always represents a potentially hazardous situation. Without proper planning, both entrants and rescuers may be at risk of death or injury. These risks can be minimized by following the approach outlined in this procedure.

B-7.5.2 DEFINITIONS

Attendant: A person who is assigned as standby to monitor a confined space process or operation, to provide support, and react as required.

Biological Hazards: Infectious agents presenting a risk or potential risk to the well-being of man or other animals, either directly through infection or indirectly through disruption of the environment.

Blanking: Inserting a solid barrier across the open end of a pipe leading into or out of the confined space, and securing the barrier in such a way to prevent leakage of material into the confined space.

Confined Space: An enclosed area that has the following characteristics (as defined by OSHA):

- is large enough and so configured that an employee can bodily enter and perform assigned work;
- is not designed for continuous human occupancy; and
- has limited or restricted means for entry and exit.

Examples of confined spaces include but are not limited to:

- tanks
- pipelines
- silos
- tank cars
- vessels
- boilers
- pits
- septic tanks
- sewers
- utility vaults
- dam galleries
- dam outlet works

Double Block and Bleed: A method used to isolate a confined space from a line, duct or pipe by physically closing two in-line valves on a piping system, and opening a "vented-to-atmosphere" valve between them.

Engulfment: The surrounding, capturing, or both, of a person by divided particulate matter or liquid.

Entry: Ingress by persons into a confined space, which occurs upon breaking the plane of the confined space portal with any part of the body; and all periods of time in which the confined space is occupied.

Hazard Evaluation: A process to assess the severity of known, real, or potential hazards at or in the confined space.

Hazardous Atmosphere: An atmosphere that may be, or is injurious to occupants by reason of: oxygen deficiency or enrichment; flammability; explosivity; or toxicity.

Hot Work: Work within a confined space that produces arcs, sparks, flames, heat, or other sources of ignition.

Isolation: A process of physically interrupting, or disconnecting, or both, pipes, lines and energy sources from the confined space.

LEL/LFL and UEL/UFL: Acronyms for "Lower Explosive Limit"/"Lower Flammable Limit" and "Upper Explosive Limit"/"Upper Flammable Limit."

Lockout/Tagout: The placement of a lock or tag on the energy-isolating device in accordance with an established procedure, indicating that the energy-isolating device shall not be operated until removal of the lock or tag in accordance with an established procedure. (The term "lockout/tagout" allows the use of a lockout device, a tag, or a combination of both.)

Non-Permit Confined Space (NPCS): A space that, by configuration, meets the definition of a confined space but after evaluation is found to have little potential for generation of hazards or has hazards that can be controlled or eliminated by engineering controls.

Oxygen Deficient Atmosphere: An atmosphere containing less than 19.5% oxygen by volume.

Oxygen Enriched Atmosphere: An atmosphere containing more than 23.5% oxygen by volume.

PEL: An acronym for "Permissible Exposure Limit" which is the allowable air contaminant level established by the U.S. Department of Labor, Occupational Safety and Health Administration.

Permit Required Confined Space (PRCS): A confined space that after evaluation has actual or potential hazards that have been determined to require written authorization for entry.

Qualified Person: A person who by reason of training, education, and experience is knowledgeable in the operation to be performed and is competent to judge the hazards involved.

TLV: An acronym for "Threshold Limit Value."

Toxic Atmosphere: An atmosphere containing a concentration of a substance above the published or otherwise known safe levels.

B-7.5.3 REGULATORY REQUIREMENTS

[INSERT CONTRACTOR] will comply with OSHA Confined Space Standard (Title 29 CFR 1910.146) and any local regulations.

The American National Standards Institute (ANSI) has issued industry guidelines similar to the OSHA regulations as ANSI Z117.1-1989.

B-7.5.4 KEY ELEMENTS OF THE [INSERT CONTRACTOR] CONFINED SPACE ENTRY PROGRAM

1. *Hazard Identification.* Identify and evaluate each hazard of the permit spaces, including determination of severity.
2. *Hazard Control.* Establish and implement the means, procedures and practice by which the permit spaces can be entered safely.
3. *Permit System.* Establish a written permit system for the proper preparation, issuance and implementation of entry permits.
4. *Employee Information.* Signs shall be posted near permit spaces to notify employees what hazards may be present and that only authorized entrants may enter the permit spaces.
5. *Prevention of Unauthorized Entry.* Prevent unauthorized employee entry through such measures as training or by posting signs and barriers, as necessary.
6. *Employee Training/Medical Surveillance.* Train employees so that attendants, authorized entrants, and personnel authorized or in charge of entry can work safely in and around permit space. Provide medial examinations as necessary for working in confined spaces and using respiratory protection.
7. *Equipment.* Provide, maintain and ensure the proper use of the equipment necessary for safe entry, including testing, monitoring, communication and personal protective equipment.
8. *Rescue.* Ensure that the procedures and equipment necessary to rescue entrants from permit spaces are implemented and provided.
9. *Protection from External Hazards.* Ensure that all pedestrian, vehicle or other barriers necessary to protect entrants from external hazards are provided.
10. *Duty to Other Employers.* Ensure that when [INSERT CONTRACTOR] employs subcontractors, [INSERT CONTRACTOR] provides the subcontractor with all available information on permit space hazards; on the OSHA Confined Space Standard; and on any other workplace hazards and emergency procedures of which the contractor needs to be aware.

B-7.5.5 CONFINED SPACE ENTRY PERMIT

A permit shall be used for all confined space entries. An example permit form HS200 is located in Appendix A. Permits must include the following:

1. the hazards of the permit space;
2. the measures for isolation of the permit space;
3. the measures, such as lockout/tagout, equipment and procedures for purging, inverting, ventilating and flushing, used to remove or control potential hazards;
4. acceptable environmental conditions, qualified with regard to the hazards identified in the permit space;
5. testing and monitoring equipment and procedures to verify that acceptable environmental conditions are being maintained during entry;
6. the rescue and other services that would be summoned in case of emergency and the means of communication with those services;
7. rescue equipment to be provided onsite, if necessary;
8. the personal protective equipment, such as respirators, clothing and retrieval lines, provided to ensure employee safety;
9. the identity of the permit space;
10. the purpose of the entry;

11. the date of the entry and the authorized duration; (a permit may be valid for up to one year, so long as all conditions under which the permit was issued are maintained).
12. a list of the authorized entrants;
13. a list of eligible attendants;
14. a list of individuals eligible to be in charge of the entry;
15. the signature, together with the name printed or otherwise legible, of the individual authorizing the entry, verifying that all actions and conditions necessary for safe entry have been performed.

The individual authorizing the entry shall sign or initial the permit before the entry begins, but not until all actions and conditions necessary for safe entry into the permit space have been performed.

Upon completion of the entry covered by the permit, and after all entrants have exited the permit space, the individual authorizing the entry shall cancel the permit. If the permit has been issued for more than one shift, the permit will be canceled when conditions change or the permit expires.

B-7.5.6 TRAINING REQUIREMENTS AND DUTIES OF PERSONNEL

B-7.5.6.1 Entrants

The individuals entering the confined space must:

1. know the hazards that may be faced during entry;
2. recognize the signs and symptoms of exposure to a hazard;
3. understand the consequences of exposure to a hazard;
4. maintain contact with the attendant;
5. notify the attendant when the entrants self-initiate evaluation of the permit space;
6. be aware of the personal protective equipment, such as retrieval lines, respirators or clothing, needed for safe entry and exit;
7. be provided with the necessary personal protective equipment;
8. use the personal protective equipment properly;
9. be aware of the external barriers needed to protect entrants from external hazards and of the proper use of those barriers; and
10. exit the permit space, unless it is physically impossible to do so, when
 - a. the attendant orders evacuation;
 - b. an automatic alarm is activated; or
 - c. the authorized entrants perceive they are in danger.

B-7.5.6.2 Attendants

An attendant is stationed and remains outside the permit space(s) at all times during entry operations and must:

1. maintain a continuous, accurate count of all persons in the space;
2. know of and recognize potential permit space hazards, and monitor activities inside and outside the permit space to determine if it is safe for entrants to remain in the space;
3. maintain effective and continuous contact with authorized entrants during entry;
4. order authorized entrants to evacuate the permit space immediately when:
 - a. the attendant observes a condition that is not allowed in the entry permit;
 - b. the attendant detects behavioral effects of hazard exposure;
 - c. the attendant detects a situation outside the space that could endanger the entrants;
 - d. the attendant detects an uncontrolled hazard within the permit spaces;
 - e. the attendant is monitoring entry in more than one permit space and must focus attention on the rescue of entrants from one of those spaces; or
 - f. the attendant must leave the work station.

5. summon rescue and other emergency services as soon as the attendant determines \ that authorized entrants need to escape;
6. take the following actions, as necessary, when unauthorized persons approach or enter a permit space while entry is underway:
 - a. warn unauthorized persons away from the space;
 - b. request the unauthorized persons to exit immediately if they have entered the permit space; and
 - c. inform the authorized entrants and any other persons designated by the employer that unauthorized persons have entered the permit space.
7. No one may enter into the permit space to attempt rescue of entrants unless he/she is trained as a rescuer, emergency procedures are followed, and back-up assistance has arrived.

B-7.5.6.3 The Person Authorizing Entry

Individuals authorizing or in charge of entry must receive the appropriate training and be approved by the [INSERT CONTRACTOR] HSO to perform the assigned duties, as follows

1. determine that the entry permit contains the requisite information before authorizing or allowing entry;
2. determine that the necessary procedures, practice, and equipment for safe entry are in effect before allowing entry;
3. determine, at appropriate intervals, that entry operations remain consistent with the terms of the entry permit, and that acceptable entry conditions are present;
4. authorize entry and terminate entry whenever acceptable entry conditions are not present; and
5. serve as authorized entrants or attendants for an entry if they have the proper training.

B-7.5.7 ATMOSPHERIC TESTING

Prior to entry, the atmosphere of a confined space must be tested:

1. oxygen content must be between 19.5 and 22%;
2. flammable gases must be less than 10% LEL ; and
3. toxic compounds must be below PELs; compounds of concern include:
 - a. carbon monoxide,
 - b. hydrogen sulfide, and
 - c. any other acutely toxic compound suspected to be present.

Atmospheric testing should be done at all levels within the confined space (from bottom to top) and should be performed as frequently as appropriate during the actual entry. The permit shall specify the monitoring requirements.

B-7.5.8 PREPARATION OF A CONFINED SPACE FOR ENTRY

Prior to entry, a confined space must be made as safe as possible. This can include:

1. ventilating the space with fresh air for as long as possible, preferably by using forced ventilation or push/pull ventilation;
2. locking out and tagging out all electrical control switches, mechanical controls, pumps, etc. that could release energy or contaminants into the confined space;
3. disconnecting or capping all inlet pipes into the confined space; double blocking and bleeding can also be used on piping; and
4. assuring safe entry via ladder, tripod, or other mechanisms.

B-7.5.9 COMMUNICATION DURING ENTRY

The system of communication must be clearly established prior to entry. Voice, walkie-talkies, handlines, phone, or any appropriate system can be used. The system must be capable of communication rapidly and reliably in the event of an emergency.

B-7.5.10 EMERGENCY AND RESCUE PROCEDURES

Only rescuers trained in confined space rescue should attempt a rescue. If an emergency occurs, the attendant should summon assistance as rapidly as possible. A pre-arranged signal to summon assistance may be used, such as use of a horn, flashing light, or other alarm device. Emergency communication devices must be clearly identified prior to entry. Rescue teams should practice confined space rescue at least once every 12 months and at least one member of the rescue team must maintain current first-aid and CPR certification. Rescue teams brought in from the outside must be made aware of the hazards that they may confront in the specific confined space.

B-7.5.11 HAZWOPER SITE SAFETY AND HEALTH PLANNING PER TITLE 29 CFR 1910.120

Confined space entry permits and planning may be included as part of site safety and health plans. Such plans will require the normal [INSERT CONTRACTOR] Health and Safety Plan approvals.

B-7.5.12 CONFINED SPACE EQUIPMENT

The following equipment is required to be used during any confined space entry:

- safety harness with d-ring and lifeline;
- tripod and personnel winch, or other suitable means of rapidly removing personnel from a confined space;
- lighting equipment;
- flame ionization detector (FID) or photoionization detector (PID);
- combustible gas/O₂/H₂S/CO monitoring capability (four gas meter);
- blower with ducting; and
- cellular telephone or two-way radio (if visible or voice contact cannot be maintained with surface assistants).

B-7.6 PERSONAL PROTECTIVE EQUIPMENT

Protective equipment shall be used and shall consist of the following:

- hard-hat;
- reflective safety vest;
- rubber boots with steel toes;
- rain gear (when needed);
- nitrile or latex gloves;
- splash-proof goggles (if desired); and
- appropriate respiratory protection (to be used only by [INSERT CONTRACTOR] personnel trained in the proper use of this equipment and with medical clearance).

In addition, the following specific health and safety equipment will be present in each vehicle used for field work:

- first aid kit;

- fire extinguisher;
- drinking water;
- wash water and soap; and
- hoist for lifting water sampler.

It is the responsibility of field crew leaders to be sure their vehicles have these items before entering the field.

B-7.7 SITE ILLUMINATION

This project will likely require personnel to work at night. Portable lighting shall be used to achieve sufficient illumination. OSHA (29 CFR Part 1910) requires 5 foot candles of illumination for the type of work covered by this plan. Vehicle lights, headlamps, and flashlights will be used to meet this requirement.

B-7.8 BIOLOGICAL HAZARDS

Field crews must protect themselves from biological hazards they may be exposed to during sampling activities. Bacteria and other micro-organisms pose the greatest threat since stormwater is known to contain high concentrations of these organisms. Crews should protect themselves by using disposable rubber gloves when handling stormwater samples. Crews should also avoid hand to mouth and hand to eye contact until they have had a chance to wash with soap and water. Eating, drinking, and smoking will not be allowed until proper decontamination has occurred.

There is also the possibility of exposure to either wild or domestic animals. Crews should avoid these animals since they may carry rabies or other diseases and they are capable of infecting serious wounds.

B-8 EMERGENCY RESPONSE PROCEDURES AND LOCATION OF NEAREST HOSPITALS

In the event of an injury, illness, or accident that may require the attention of a physician, the SSO must be notified immediately. If a person(s) is transported to a medical facility, the location of this facility must be given to the SSO. In emergency situations field personnel should call 911 for an emergency response team. Describe the injury or illness and answer all questions. All [INSERT CONTRACTOR] employees and subcontractor personnel must be familiar with the location of and route to the hospitals listed below. Figure B-8.1 shows the location of the two hospitals.

Hospital:[INSERT LOCAL HOSPITAL(S) AND ADDRESS(ES)]

Hospital:[INSERT LOCAL HOSPITAL(S) FIGURE]

B-9 FORMS AND CHECKLISTS

EMPLOYEE ACKNOWLEDGMENT

(Please sign, detach and return to [INSERT CONTRACTOR] Project Manager by [INSERT DATE])

I hereby certify that I have read and understand the safety and health guidelines contained in [INSERT CLIENT] Stormwater Monitoring Project Health and Safety Plan.

Employee Name

Signature

Date

In case of emergency, please contact:

1.

Name

Relationship

Phone Number

2.

Name

Relationship

Phone Number

Received by:

Site Safety Officer

Signature

Date

**SAMPLE FORM HS200
CONFINED SPACE ENTRY PERMIT
(page 1 of 2)**

Project Name/No. _____

Location of Confined Space:

Purpose of Entry and Description of Work:

Possible Hazards:

Names of Authorized Entrants:

Names of Eligible Attendants:

Individuals to be In Charge:

Rescue Service Information:

Responding Team:

Address: _____

Phone No.: _____

**Hazard Control Measures (e.g. Ventilation)
Complied? _____ (SSO must initial prior to entry)**

**List of Rescue Equipment Required on Site
Complied? _____ (SSO must initial prior to entry)**

**Communication Procedures and Equipment
Complied? _____ (SSO must initial prior to entry)**

**Personal Protective Equipment Required Complied?
_____ (SSO must initial prior to entry)**

Lockout/Tagout Procedures Required

Comments/Additional Information

Complied? _____ (SSO must initial prior to entry)

SAMPLE FORM HS200
 CONFINED SPACE ENTRY PERMIT
 (page 2 of 2)

| Test | Location | Reading | Acceptable Range |
|-------------------|----------|-------------|------------------|
| Oxygen | _____ | _____ % | 19.5-22 % |
| Flammability | _____ | _____ % LEL | Less than 10 % |
| Toxics (Specify): | _____ | _____ | _____ |
| | _____ | _____ | _____ |
| | _____ | _____ | _____ |

For continuous or periodic monitoring, record results in [INSERT CONTRACTOR] Health and Safety report.

Entry Date _____

Duration: Start Time _____ End Time _____

Is hot work to be performed? Yes _____ No _____

Individual in charge of entry approval:

Name _____ Signature _____ Date/Time _____

The individual responsible for entry verifies that all actions and conditions have been met for safe entry into the described space.

Permit Cancellation

All work is completed and all entrants are exited from the permit space.

Signature of Individual in Charge _____ Date/Time _____

SAMPLE FORM HS-100
(INSERT CONTRACTOR HEALTH AND SAFETY INCIDENT REPORT)

Project Name: _____ TYPE OF INCIDENT (Check all applicable items)

Project Number: _____ Illness Fire, explosion, flash

Date of Incident: _____ Injury Unexpected exposure

Time of Incident: _____ Property Damage Vehicular Accident

Location: _____ Health & Safety Infraction

_____ Other (describe) _____

DESCRIPTION OF INCIDENT (Describe what happened and possible cause. Identify individual involved, witnesses, and their affiliations; and describe emergency or corrective action taken. Attach additional sheets, drawings, or photographs as needed.)

Reporter: _____

| | | |
|------------|-----------|------|
| Print Name | Signature | Date |
|------------|-----------|------|

Reporter must deliver this report to the Health & Safety Officer within 24 hours of the reported incident for medical treatment cases and within five days for other incidents.

Reviewed by: _____ Date _____

Operating Unit Health & Safety Officer

Distribution by HSO:

- Health and Safety Manager
- Health and Safety Officer (file)
- INSERT CONTRACTOR Project Manager
- Personnel Office (medical treatment cases only)